

Application of burners and controls to gas fired process plant



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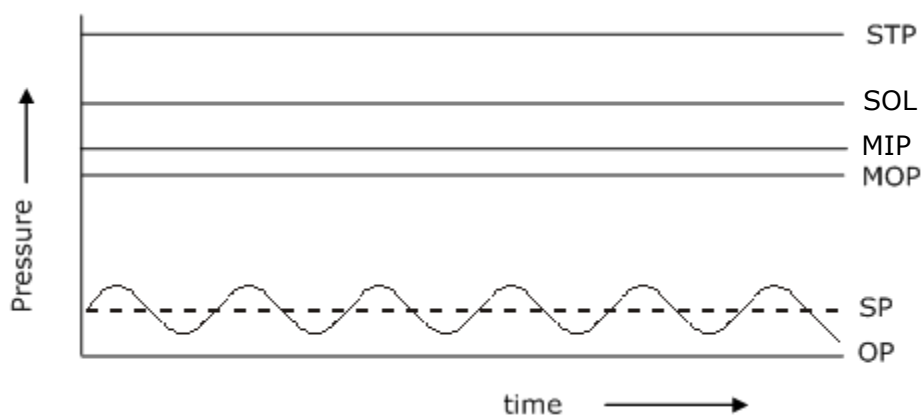
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SECTION 1 : INTRODUCTION

- 1.1 This Standard supersedes IGE/UP/12, Communication 1713, which is obsolete.
- 1.2 This Standard has been drafted by an Institution of Gas Engineers and Managers (IGEM) Panel, appointed by IGEM's Gas Utilization Committee and has been approved by IGEM's Technical Co-ordinating Committee on behalf of the Council of IGEM.
- 1.3 It is recognised that many combustion systems use forced draught burners that comply with BS 5885 and BS EN 676. Such installations now have to comply with BS EN 746-2 and this Standard covers all such systems, as well as those using full pre-mix, partial pre-mix and natural draught aeration systems.
- 1.4 This Standard embraces the major requirements of the withdrawn Health and Safety Executive (HSE) publication HS(G)16.
- 1.5 It is important that those involved in the design, installation and maintenance of gas-fired plant are competent and suitably trained to ensure safety. In general, process plant is not in the scope of the Gas Safety (Installation and Use) Regulations (GS(I&U)R). However, compliance with the intent of GS(I&U)R is recommended. In this respect, employers' attention is drawn to the requirements of IGEM/IG/1.
- 1.6 It is recognised that many items of existing plant may not comply with current Standards. This Standard may be used as a basis for updating. The degree of updating will depend upon the capital available and the risks associated with the operation of the plant.
- 1.7 As far as is practicable, gas fired plant needs to be fitted with flame safeguards and the fuel/air ratio controlled such that rich firing does not occur. For high temperature plant where the operating temperature exceeds 750°C and flame protection is not practicable, a minimum of a weep by-pass pressure proving check (see Appendix 11) is recommended.
- 1.8 Terms such as "maximum operating pressure" (MOP), "maximum incidental pressure" (MIP) and "operating pressure" (OP) "lowest operating pressure" (LOP) and "design minimum pressure" (DmP) were introduced in IGEM/UP/2 Edition 2 to reflect gas pressure terminology used in European standards.

Other terms were introduced to assist in recognition of design information to be transferred between interested parties.

Referring to Figure 1, attention is drawn to how operating pressure oscillates about the set point (SP). Note also that MOP can be declared at a higher value than OP. The strength test pressure (STP) has to exceed MIP. This means that, at least with respect to integrity, the installation will withstand a fault pressure from the upstream system. Safe operating limit (SOL) is a requirement of the Pressure Systems Safety Regulations (where applicable).



STP	=	Strength test pressure
SOL	=	Safe operating limit
MIP	=	Maximum incidental pressure
MOP	=	Maximum operating pressure
SP	=	Maximum set point of, typically, the active regulator
OP	=	Operating pressure.

FIGURE 1 - OPERATIONAL PRESSURE LIMITS

This Standard makes use of the terms “must”, “shall” and “should” when prescribing particular requirements. Notwithstanding Sub-Section 1.12:

- the term “must” identifies a requirement by law in Great Britain (GB) at the time of publication
- the term “shall” prescribes a requirement which, it is intended, will be complied with in full and without deviation
- the term “should” prescribes a requirement which, it is intended, will be complied with unless, after prior consideration, deviation is considered to be acceptable.

Such terms may have different meanings when used in legislation, or Health and Safety Executive (HSE) Approved Codes of Practice (ACoPs) or guidance, and reference needs to be made to such statutory legislation or official guidance for information on legal obligations.

1.9

The primary responsibility for compliance with legal duties rests with the employer. The fact that certain employees, for example “responsible engineers”, are allowed to exercise their professional judgement does not allow employers to abrogate their primary responsibilities. Employers must:

- have done everything to ensure, so far as it is reasonably practicable, that “responsible engineers” have the skills, training, experience and personal qualities necessary for the proper exercise of professional judgement
- have systems and procedures in place to ensure that the exercise of professional judgement by “responsible engineers” is subject to appropriate monitoring and review
- not require “responsible engineers” to undertake tasks which would necessitate the exercise of professional judgement that is not within their competence. There should be written procedures defining the extent to which “responsible engineers” can exercise their professional judgement. When “responsible engineers” are asked to undertake tasks which deviate from this, they should refer the matter for higher review.

- 1.10 It is now widely accepted that the majority of accidents in industry generally are in some measure attributable to human as well as technical factors in the sense that actions by people initiated or contributed to the accidents, or people might have acted in a more appropriate manner to avert them.
- It is therefore necessary to give proper consideration to the management of these human factors and the control of risk. To assist in this, it is recommended that due regard be paid to HSG48 and HSG65.
- 1.11 Notwithstanding Sub-Section 1.9, this Standard does not attempt to make the use of any method or specification obligatory against the judgement of the responsible engineer. Where new and better techniques are developed and proved, they ought to be adopted without waiting for modification to this Standard. Amendments to this Standard will be issued when necessary, and their publication will be announced in the Journal of the Institution and other publications as appropriate.
- 1.12 Requests for interpretation of this Standard in relation to matters within its scope, but not precisely covered by the current text, need to be addressed in writing to Technical Services, IGEM, IGEM House, High Street, Kegworth, Derbyshire, DE74 2DA and will be submitted to the relevant Committee for consideration and advice, but in the context that the final responsibility is that of the engineer concerned. If any advice is given by or on behalf of IGEM, this does not relieve the responsible engineer of any of his or her obligations.
- 1.13 This Standard was published in June 2015.

SECTION 2 : SCOPE

- 2.1 This Standard provides the minimum requirements for combustion systems in respect of safety in start-up, operation and shut-down of gas-fired process plant. It does not provide a complete specification for burners, plant and control equipment.
- 2.2 This Standard applies to the use of gas in plant in industrial and commercial premises and nothing in this Standard implies any requirement for burners or appliances for other applications, for example for gas turbines (see IGE/UP/9) or for appliances constructed to recognised European standards such as hot water boilers and air heaters for space heating.
- 2.3 This Standard applies to relevant plant using Natural Gas (NG). It may also be applied for other gases and fuels where no other guidance is available, provided due allowance is made for the different combustion qualities and fuel characteristics.
- 2.4 This Standard applies to dual fuel and multi-fuel plant when operating on NG. Further advice on dual fuel and multi-fuel firing is given in Section 10.
- 2.5 It is recognised that, for specialised gas fired processes, it is permissible to use procedures which differ from those given in this Standard but which, nevertheless, comply with the intent. Similarly, new systems or procedures resulting from advances in technology may be applied to give equal or improved safety. It is not intended that this Standard prohibit the development or use of such systems, but any departure from this Standard is not recommended except when on the basis of sound engineering judgement, experience and subject to a risk assessment.
- 2.6 This Standard does not apply to:
- burners firing in the open and under constant manual supervision, for example Bunsen burners, gas rings, small open ended furnaces, etc.
 - small industrial plant and appliances of heat input not exceeding 7.5 kW (25000 Btu/h), for example soldering irons, glue pots, small lead pots
 - burners, appliances or plant covered by specific manufacturing standards, for example BS 5885, BS 5990 and BS 5978. However, they do include application requirements for such burners when applied to process plant
 - plant covered by specific British or European manufacturing standards, for example BS EN 676. However, they do include the application of such plant
 - heating plant such as boilers and air heaters supplied complete with matched burners
 - gas turbines, for which reference should be made to IGE/UP/9
 - spark ignition and dual-fuel engines, for which reference should be made to IGEM/UP/3 Edition 2
 - the distribution and use of protective atmosphere gases, for which reference should be made to BS EN 746-3. However, for atmosphere gas burner control and safety systems, this Standard applies.
- 2.7 This Standard assumes that plant is designed and installed in accordance with good engineering practice and having due regard to GS(I&U)R and the Management of Health and Safety at Work Regulations (MHSWR).

- 2.8 Gas-fired process plant is required to comply with the Supply of Machinery (Safety) Regulations and, where appropriate, the requirements of the Pressure Systems Safety Regulations (PSSR) and the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR).
In general, The Gas Appliances (Safety) Regulations are not relevant as they apply to appliances for cooking, heating, hot water production (at temperatures not exceeding 105°C) refrigeration, lighting and washing. Appliances designed for industrial processes on industrial premises are also excluded from the scope of the Regulations. Certain process plant, such as hot water boilers not specifically designed for process applications but used in conjunction with process equipment, may fall within the scope of the Regulations.
- 2.9 This Standard applies to both high temperature plant (defined as having a normal working temperature sufficient to ignite the fuel, that is above 750°C at the working chamber walls) and low temperature plant (defined as having a normal working temperature at or below 750°C). High temperature plant will also operate in the low temperature mode at some time in its operation and this has to be taken into account when assessing safety issues.
- 2.10 This Standard applies to new plant and it is not the intention to apply any requirements retrospectively. However, if existing plant is being upgraded, it is recommended that the intent of this Standard is to be followed as far as possible. A risk assessment is to be made whenever any changes are proposed for any plant (see IGE/SR/24).
- 2.11 All pressures are gauge pressures unless otherwise stated.
- 2.12 All heat inputs are net heat inputs unless otherwise stated.
- 2.13 Italicised text is informative and does not represent formal requirements.
- 2.14 Appendices are informative but can represent formal requirements if referred to via the prescriptive terms "should", "shall" or "must".